

CLAIMS

[1] A speaker device comprising:
a housing having an opening portion;
a vibration system member for vibrating to generate
5 sound;

a support system member connected to the housing and
for supporting the vibration system member in a manner which allows
the vibration system member to vibrate;

a first magnetic circuit disposed inside the housing
10 and having a first magnet on a surface thereof facing the opening
portion; and

a second magnetic circuit having a second magnet disposed
inside the housing and facing the first magnet via a gap,

wherein a magnetic gap is formed in at least one of the
15 first and second magnetic circuits,

the vibration system member includes:

a first voice coil;

a first voice coil bobbin for disposing the first
voice coil in the magnetic gap; and

20 a non-magnet member made of a magnetic material which
does not include a magnet, and connected directly or indirectly
to the first voice coil bobbin so that the non-magnet member is
disposed in a first gap between the first magnet and a second magnet.

25 [2] The speaker device according to claim 1, wherein

the vibration system member further includes a diaphragm at least a portion of which is composed of the non-magnet member, the first voice coil bobbin is fixed to the diaphragm, and

5 the support system member supports the diaphragm in the first gap in a manner which allows the diaphragm to vibrate.

[3] The speaker device according to claim 1, wherein the second magnetic circuit includes:

10 a magnetic plate fixed to a surface facing the opening portion of the second magnet; and

a yoke disposed at at least a portion of a surrounding of the second magnet and the magnetic plate, and forming a second gap between the second magnet and the magnetic plate,

15 the vibration system member further includes a diaphragm disposed, facing a surface facing the opening portion of the housing of the second magnetic circuit,

the first voice coil bobbin connects the diaphragm and the non-magnet member via the second gap, and

20 the first voice coil is disposed in a magnetic gap formed in the second magnetic circuit.

[4] The speaker device according to claim 3, wherein the vibration system member further includes:

25 a second voice coil; and

a second voice coil bobbin fixed to the non-magnet member and for disposing the second voice coil in the magnetic gap formed in the first magnetic circuit.

5 [5] The speaker device according to claim 1, wherein the second magnetic circuit includes:

a magnetic plate fixed to a surface facing the opening portion of the second magnet; and

a yoke disposed at at least a portion of a surrounding
10 of the second magnet and the magnetic plate, and forming a second gap between the second magnet and the magnetic plate,

the vibration system member further includes:

a diaphragm disposed, facing a surface facing the opening portion of the housing of the second magnetic circuit;

15 and

a connection member for connecting the diaphragm and the non-magnet member via the second gap, and

the first voice coil bobbin disposes the first voice coil in the magnetic gap formed in the first magnetic circuit.

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[6] The speaker device according to claim 1, wherein

the first and second magnetic circuits have the same structure, and

the second magnetic circuit and the first magnetic
25 circuit are arranged symmetrically about the non-magnet member.

[7] The speaker device according to claim 6, wherein
the vibration system member further includes:

a second voice coil; and

5 a second voice coil bobbin connected directly or
indirectly to the non-magnet member and for disposing the second
voice coil in the magnetic gap formed in the first magnetic circuit,
the first voice coil bobbin disposes the first voice
coil in the magnetic gap formed in the second magnetic circuit.

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[8] The speaker device according to claim 1, wherein
the first magnetic circuit includes:

a magnetic plate fixed to the first magnet;

a third magnet fixed to the magnetic plate; and

15 a yoke for forming a magnetic gap between the yoke
and the magnetic plate, and

the first magnet and the third magnet are magnetized
in directions opposite to each other, the directions being
vibration directions of the vibration system member.

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[9] The speaker device according to claim 1, wherein
the second magnetic circuit includes:

a magnetic plate fixed to the second magnet;

a third magnet fixed to the magnetic plate; and

25 a yoke for forming a magnetic gap between the yoke

and the magnetic plate, and

the second magnet and the third magnet are magnetized in directions opposite to each other, the directions being vibration directions of the vibration system member.

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[10] The speaker device according to claim 1, wherein the first magnetic circuit includes:

a magnetic plate fixed to the first magnet; and

a yoke for forming a magnetic gap between the yoke

10 and the magnetic plate, and

the first magnet is magnetized in a vibration direction of the vibration system member.

[11] The speaker device according to claim 1, wherein

15 the second magnetic circuit includes:

a magnetic plate fixed to the second magnet; and

a yoke for forming a magnetic gap between the yoke

and the magnetic plate, and

20 the second magnet is magnetized in a vibration direction of the vibration system member.

[12] The speaker device according to claim 1, where

the speaker device comprises a plurality of magnetic circuit units each composed of the first and second magnetic
25 circuits,

the vibration system member includes:

the same number of the first voice coils as the number of the magnetic circuit units;

the same number of the first voice coil bobbins as the number of the magnetic circuit units, each first voice coil being disposed in the magnetic gap of the corresponding magnetic circuit unit; and

a diaphragm fixed to each first voice coil bobbin and at least a portion of which is composed of a non-magnet member.

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[13] The speaker device according to claim 1, further comprising:

a position detecting section for detecting a position of the vibration system member; and

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a control section for controlling a vibration of the vibration system member by applying to the voice coil a signal obtained by adding a direct current component to an acoustic signal based on the position of the vibration system member detected by the position detecting section so that a center of an amplitude of the non-magnet member is at a balanced position of a magnetic field formed in the first gap.

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[14] The speaker device according to claim 13, wherein the position detecting section is a laser displacement gauge.

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[15] The speaker device according to claim 1, further comprising:

 a frame fixed to the support system member,

 wherein a speaker unit composed of the vibration system
5 member, the support system member, the first and second magnetic
circuits, and the frame, is attached to the opening portion by
the frame being fixed to the opening portion.

[16] A car comprising:

10 the speaker device according to any of claims 1 to 15;
and

 a car body inside which the speaker device is disposed.

[17] A video device comprising:

15 the speaker device according to any of claims 1 to 15;
and

 a device housing inside which the speaker device is
disposed.